E. J. PACE.

SWITCH MECHANISM.

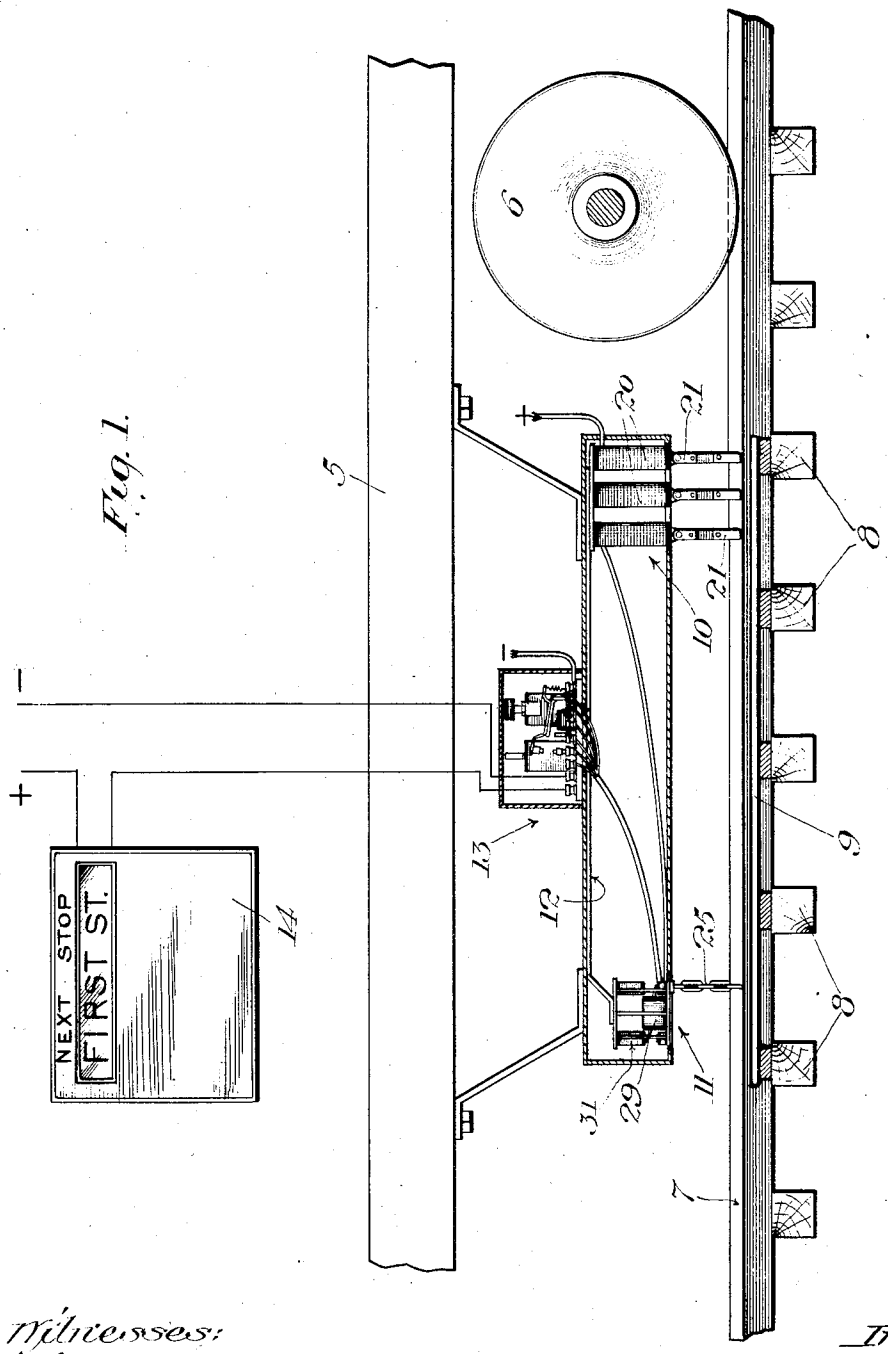
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1,082,210.

Patented Dec. 23, 1913.

2 SHEETS—SHEET 1.

Fig. 1.



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2 SHEETS—SHEET 2.

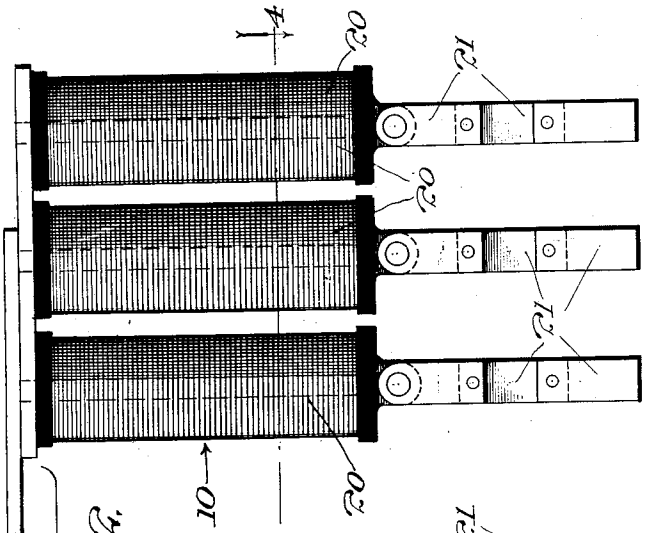


Fig. 2.

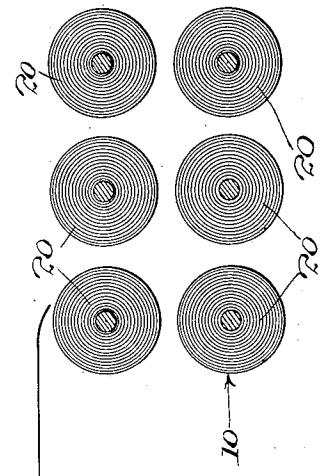


Fig. 4.

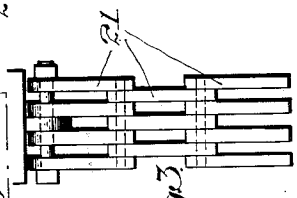
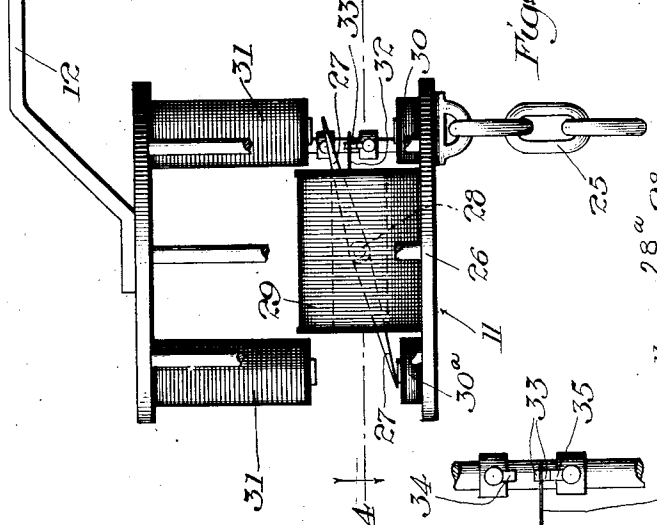
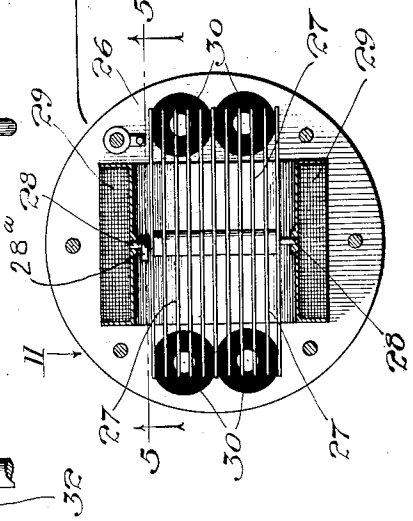


Fig. 3.





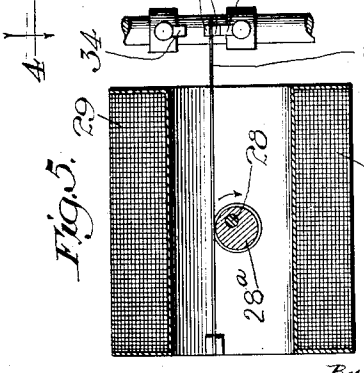


Fig. 5.

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UNITED STATES PATENT OFFICE.

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SWITCH MECHANISM.

1,082,210. Specification of Letters Patent. Patented Dec. 23, 1913.

Application filed December 23, 1911. Serial No. 667,439.

To all whom it may concern:

Be it known that I, EDGAR J. PACE, a citizen of the United States, residing at Los Angeles, in the county of Los Angeles, State of California, have invented new and useful Improvements in Switch Mechanisms, of which the following is a specification.

This invention relates generally to a switch mechanism adapted for operating by virtue of relatively moving objects, such as a train moving over a track; and this invention has for its immediate object the provision of a certain mechanism whereby certain actuations may be obtained without the necessity of any mechanical contacts between the relatively moving members.

My invention takes the form of a magnetically actuated mechanism in combination with magnetic means for actuating that mechanism. Fundamentally, (to take the case of a train on a track as an illustration) I provide some sort of stationary magnetic member and a means to charge that member, the member being placed conveniently on the track; and I provide a magnetically actuable switch mechanism on the trains, which switch mechanism will be actuated by magnetic influence when it passes over the stationary magnetic member, not necessarily touching that member. My mechanism is thus above broadly described; but there are certain features conducive to practical utility which I will now broadly explain.

It is desirable that the magnetic bar stationarily placed on the track be as dissimilar as possible to the ordinary magnetic pieces, such as rails and plates, which may be passed at a crossing; and it is also desirable that as much as possible of the actual mechanism of the device be kept on the train. This last is desirable for the reason that there must be a certain amount of mechanism carried by the train even if all possible mechanism is stationarily placed on the track, and I have found that it is possible to place all the working mechanism on the train, leaving only a plain bar of magnetic material, such as a flat bar of wrought iron, on the track. Thus my device is practically developed to include the following combination: a stationary magnetic bar placed on the track and of some length in a direction longitudinal of the track; a magnet carried on the train and adapted to pass over and to inductively magnetize the bar; and a magnetically actuable mechanism on the train and spaced from the magnet a distance somewhat corresponding to the length of the bar so that, when the magnet is over one portion of the bar, the mechanism will be over another portion and will be actuated by the magnetism induced thereinto. The magnet and the mechanism are preferably spaced apart a distance unequal to the distance between the rails and other parts likely to be crossed by the train; so that there is no possibility of the mechanism being actuated at any point other than that intended.

The magnetically actuated switch mechanism may be used to operate any sort of mechanism desired; I have developed this mechanism primarily in connection with street and station indicators, advertising devices and the like; but the device may be put to any use.

I will now explain the details of construction of a preferred form of my device, this form being shown in the accompanying drawings, in which—

Figure 1 is a partially diagrammatic side elevation showing my device as it appears for use. Fig. 2 is an enlarged side elevation of the charging magnet and the magnetically actuated mechanism of my device. Fig. 3 is an end view of the members through which magnetism is conducted from the charging magnets to the track plate. Fig. 4 is a section taken on line 4—4 of Fig. 2. Fig. 5 is a section taken on line 5—5 of Fig. 4.

In the drawings 5 designates the body or floor of a car of any description supported on wheels 6 running on track 7. Track 7 may be composed of the ordinary rails on ties 8, and on these same ties, or on the pavement between the rails, is mounted the track plate or bar 9 before referred to. This track plate may be a flat iron bar of suitable dimensions.

Mounted on the under side of the car at some convenient point, and so that it will pass over the track plate 9, are magnets 10 and magnetically actuable mechanism 11. These two portions of the device may be connected by a spacer bar 12 to insure their being spaced apart the proper distance with relation to the length of plate 9 and with

relation to the length of spacing of other magnetic members liable to be crossed. At any place in the car may be situated a relay mechanism 13 and this relay mechanism is connected to, and in reality forms a part of, indicator 14. For this reason this mechanism does not enter directly into the present invention; the intended scope of this invention only including the magnetically actuated mechanism as far as the operation of its switch which controls the actuation of relay mechanism 13.

Magnet 10 in the present form of device consists of six electro-magnets 20 of suitable size and configuration and mounted and wound so as to all present the same polarity below. From their lower ends depend magnetic chains or other flexible members 21 for the purpose of transmitting the magnetism generated in the magnets to a point as close as practicable to the track plate 9. These chains may be efficiently made as is shown in Figs. 2 and 3, or they may be ordinary link chains as is illustrated on the magnetically operated mechanism in Fig. 2.

When the magnets stand over the track plate somewhat as illustrated in Fig. 1, the track plate is inductively magnetized and will exert a magnetic influence on the mechanism 11 above. Mechanism 11 comprises primarily a needle 27 (I use the expression "needle"; but any equivalent form of device will answer), preferably multiple, pivoted suitably at 28 and magnetized in a suitable manner. I prefer to magnetize the needle by surrounding it with a stationary magnetizing coil 29, leaving the needle as free to move as possible. The normal position of the needle is shown in Fig. 2; and there are shown several arrangements for keeping it in that position, of which I may use one or more. In the first place, the needle has a tendency, under the magnetic influence of coil 29, to move either to the position shown in Fig. 2 or to the position oppositely inclined. In other words, the system with the needle at any intermediate position is in unstable equilibrium. This is caused by the fact that the lines of force in the magnetizing coil take their shortest paths when the needle is closest to the winding, which is true when the needle is in either of its most inclined positions; or, expressing the same phenomenon in other words, that the magnetism of the hollow coil is most intense at the inner periphery and therefore draws the needle as much as possible to that region. The needle will thus normally remain as shown in Fig. 2 when once placed in that position. I have also shown electro-magnets 30 which may be magnetized to repel and attract the needle ends to hold the needle in position as illustrated. These magnets may be either constantly or temporarily energized. Magnets 30 may be utilized to return the needle to normal position, being temporarily energized to appropriately attract and repel the needle ends. But these magnetic means do not directly enter into the present invention. The needle 27 and its immediate mechanism are mounted on a frame 26 from which may depend a chain 25 useful for concentrating magnetism between the track plate 9 and the needle.

Mounted on axis 28 is an eccentric or cam 28ª which operates beneath a spring arm 32 carrying contacts 33 on its outer end. Rotation of the axis 28 in the direction indicated in Fig. 5 will cause the arm 32 to be raised and will cause one of its contacts 33 to engage with contact 34. These two contacts form a switch which is closed when the needles are in the position shown in Fig. 1. When the needles are in the position shown in Fig. 2, the lower contact 33 engages with a contact 35, thus closing another switch. But the details of this switch are of no importance as far as the present application is concerned; it suffices to say that one or both of these switches control the action of the mechanism connected thereto, including the relay mechanism and the indicator device. The spring arm 32 acting on the cam 31 tends to always move the needle toward the position of Fig. 2; and, for the purposes of this application, this arm and cam may be considered the effective means of returning the needle to normal position after actuation.

In operation the magnets 20 and magnetizing coil 29 are constantly excited from any suitable electrical circuit; the needle normally standing as in Fig. 2. When the magnet and needle mechanism pass over the track plate 9 magnetic lines of force are conducted through the track plate from the magnets to the needle mechanism. Assuming the various polarities to be as indicated in the drawings, the normally upper end of the needle will be immediately attracted downwardly and the normally lower end repelled upwardly, the needle then standing in the position shown in Fig. 1, oppositely inclined to the position shown in Fig. 2. By its movement, the needle operates the switch mechanism described which in turn causes the actuation of the mechanism.

What I wish to broadly claim in this application, outside of any peculiarities of construction is the broad combination of an actuating magnet (some source of magnetism) and a magnetically actuable mechanism, and an immovable magnetic conductor adapted to transiently bridge the space between the magnet and mechanism so as to inductively supply magnetic energy to the mechanism—or, expressed otherwise, the actuating magnet and needle being together movable in such relation to the conductor that the conductor bridges the space between

the magnetic source and needle and thereby directly actuates the needle.

Specifically, I wish to claim more or less closely the preferred form of mechanism shown and described; but it will be inferred that a great many changes may be made from this specific form without departing from the boundaries of my invention. For instance, the nature and form of the charging magnets are not of extreme moment. I utilize electro-magnets for the reason that they may be kept constantly and uniformly charged; but permanent magnets, or magnets of an electro permanent form, might be just as well used. The exact form of the magnetically actuated device is of no great importance as, even specifically, my invention may be embodied in different forms of moving members, such as needles, and in different forms of switch mechanisms, and in different arrangements for causing the movement of the moving members.

Having described my invention, I claim:—

1. In combination, a source of magnetism and a magnetically movable needle spaced apart from each other, and an immovable magnetic conductor, said source and needle together being movable in such relation to the conductor that the conductor bridges the space between the magnetic source and needle and thereby directly magnetically actuates the needle.

2. In combination, a source of magnetism and a magnetically movable needle spaced apart from each other, and an immovable magnetic conductor, said source and needle together being movable in such relation to the conductor that the conductor bridges the space between the magnetic source and needle and thereby directly conducts magnetism from the source to the needle.

3. In combination, an electro-magnet and a needle mechanism spaced apart, said mechanism comprising an annular magnetizing coil and a multiple needle pivoted within the coil on an axis transverse to the coil axis and means to return the needle after movement to a certain position with relation to the coil, and a magnetic conductor over which the electro-magnet and the needle mechanism are adapted to pass, the conductor being inductively magnetized by the electro-magnet and by virtue of such magnetization moving the needle by direct magnetic traction.

4. In combination, an electro-magnet and a needle mechanism spaced apart, said mechanism comprising an annular magnetizing coil, a needle gravitationally balanced on and symmetrically arranged with respect to a pivot transverse to the coil axis and means to return the needle after movement to a certain position with relation to the coil, and a magnetic conductor over which the electro-magnet and the needle mechanism are adapted to pass, the conductor being inductively magnetized by the electro-magnet and by virtue of such magnetization moving the needle by direct magnetic traction.

5. In combination, a source of magnetism and an immovable magnetically movable member spaced apart from each other, and a magnetic conductor, said source and member together being movable in such relation to the conductor that the conductor bridges the space between the magnetic source and the movable member and thereby directly magnetically actuates the member.

6. In combination, a movable announcing element, a magnet controlling said element, a needle controlling the magnet and magnetically held in non-actuating position, a magnet spaced from the needle to be normally non-acting on said needle, all of said parts being carried by a vehicle, and a fixed metallic plate for conducting magnetism to the needle to move said needle to actuating position.

7. A movable carrier, a circuit controlling needle carried thereby, a magnet for holding said needle in non-actuating position, a source of magnetism carried by said carrier and supported thereby to be non-acting on the needle and a plate located along the line of travel for conducting magnetism from the source of magnetism to the needle to move said needle to actuating position.

In witness that I claim the foregoing I have hereunto subscribed my name this 16th day of December, 1911.

EDGAR J. PACE.

Witnesses:
JAS. H. BALLAGH,
O. E. KELLUM.